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Tank-farm workers install a highly specialized camera through a riser in single-shell Tank C-104. Recent video footage and radiation readings from a gamma probe will help the DOE Office of River Protection and CH2M HILL Hanford Group plan the best approach for retrieving more than a quarter of a million gallons of radioactive sludge from the tank.

Special camera used to probe inside Tank C-104

Geoff Tyree, CHG

Hanford crews are using a highly specialized video camera to look inside one of the site's oldest underground waste tanks. The video footage will help planners determine the best approach for removing more than a quarter of a million gallons of radioactive sludge from Tank C-104.

In the past, 67 of the aging single-shell tanks have leaked or are assumed to have leaked approximately a million gallons of waste. To avoid the risk of a future tank leak, any method chosen for removing the solid waste in Hanford's single-shell tanks will need to use as little liquid as possible.

Plans call for retrieving the sludge waste in Tank C-104 using a remotely operated device that moves within the waste, using relatively small amounts of liquid to dilute and pump the waste out of the tank.

Crucial work

Operators are using a camera to see which openings, or risers, in the tank's dome are available for equipment installation. They're also looking at the surface of the waste to see what might get in the way of retrieving the sludge — equipment, for example, that had been dropped into the tank over the decades. Other inspections will include nearby "pits" that may house equipment that supports retrieving waste from Tank C-104.

"This work is crucial to starting the effort to get solid waste out of Hanford's single-shell tanks," said Rick Raymond, manager of the Single-Shell Tank Project for CH2M HILL Hanford Group. "The video we shoot will allow us to make decisions on the best way to clean up this tank."

Continued on page 10.

Special camera used to probe inside Tank C-104, cont.

On May 3, Hanford crews lowered the 2.9-inch-diameter camera system into Tank C-104. The camera system has been developed for video work in Hanford tanks. The high-resolution video camera is fastened to the front end of a 21-inch-long assembly with remote-controlled motors that allow the camera to pan and tilt. The assembly is made of stainless steel, which makes it easier to decontaminate and use again.

The stainless steel material is also spark-resistant, which is an important safety feature for operating in a potentially flammable hydrogen gas environment. Filtered air continuously flows around the camera's internal parts, pressurizing the camera housing to keep hydrogen gas away from potential spark sources.

Camera design

A CHG engineering team, working with Eugene, Ore.-based R.J. Electronics, has made several recent improvements to a previous camera design to allow operators to see further and shoot sharper video. After the camera is lowered into a tank, a light pops out and allows operators to see to a distance of up to 75 feet. This is an improvement on a previous design that allowed operators to see to a distance of 40 feet.

Other improvements include a longer “zoom” capability, a more light-sensitive camera chip and an equipment safety feature that reduces the chance of mechanical failure when manipulating the camera for different views. Both the light and zoom capabilities are important for being able to see the entire tank, which is 75 feet wide and over 35 feet high, and for getting close-ups of small areas of interest.

Hot environment

Electronic chips inside the camera are sensitive to the gamma radiation from the tank waste, limiting the camera's useful life. The engineering team carefully selected a camera chip that lasts longer in a radioactive environment. The camera's shooting schedule is carefully organized to limit its exposure.

“We can efficiently utilize the camera system to monitor in-tank activities, decontaminate it and continue to use it for other tank projects,” said Dave Smet, CHG engineer.

The Department of Energy Office of River Protection and CHG are working toward a Tri-Party Agreement milestone to build and demonstrate the sludge waste retrieval technology in Tank C-104 by 2008. It's a 530,000-gallon tank constructed with a single carbon steel shell surrounded by thick concrete. It was among the first large underground tanks built in the 1940s to receive waste from nuclear materials production at Hanford.

Nearly all of the liquid waste in the tank had been removed by 1989 — part of a program called interim stabilization to reduce the risk of leaks in Hanford's 149 older single-shell tanks.

“While removing the liquid waste was an important step, we're working toward getting the remaining waste out of this and other single-shell tanks so it can be treated,” said Raymond. “That gets us closer to the ultimate goal of closing the tanks and solving the Hanford tank waste problem for good.” ♦